Section 3 ■ CONTENTS

Section 3
INTRODUCTION

This section includes a general physical description of the Bear River Basin. It also includes some general planning guidelines and the organizational arrangements used in preparing the basin plan.

3.1 BACKGROUND

Through the Board of Water Resources and the Division of Water Resources (division), the state has a leadership role in water planning and development and coordinating the activities of other state and federal agencies involved. Formulation of basin plans fits within the state water policy framework, which includes regulation, conservation, development, protection of water quality, and management. Municipal and industrial (M&I), agricultural, fish and wildlife, and recreational uses are part of the planning. The interrelation of water resource demands and activities is recognized and incorporated.

The Bear River Basin Plan includes a description of significant water problems, options available to resolve them, and recommendations for future action. One main purpose of the plan is to identify problems which need early attention. Each recommendation in the basin plan addressing an identified need is consistent with the state water policies identified in the 1990 State Water Plan (SWP).

Previous water-related studies conducted by state and federal agencies in the Bear River Basin have provided important information on the basin resources and, in some cases, alternative water development plans. The studies used in preparing this report are listed by number at the end of each section, and are referenced in the narrative by the same number.

The Bear River Basin Plan is prepared at a reconnaissance level, giving a general assessment of problems and demands and identifying their location. Basin planning is a continuous process, and the plans are flexible to allow for future revisions. Water management, protection of water quality, and conservation needs are delineated, and all potential uses of streams are considered. It is intended that both the formulation of a plan and its implementation will provide for a balance of environmental, economic, social, and political factors.

Over the years, many water supply projects have been built by private individuals, non-profit irrigation companies, and incorporated municipalities. The state and the federal government have participated in basin water development. Substantial hydropower developments have been built and are being operated by Utah Power & Light Company (UP&L) and several municipalities. Future water development projects in the basin can be expected because of the quantity of undeveloped water available, the projected growth, and an increasing demand for water along the Wasatch Front where water is less plentiful.

3.2 DESCRIPTION OF BASIN

The Bear River Basin is unique in many ways. In order to better understand the problems, alternatives, and recommended actions, a brief description of the basin's physical characteristics is presented.

3.2.1 Drainage Area and Topography

While the basin encompasses parts of three states, the Bear River begins and ends in Utah. The river begins about 60 air miles east of Salt Lake City in the Uinta Mountains, and flows through parts of southwestern Wyoming and southeastern Idaho before returning to Utah and emptying into the Great Salt Lake. The total river length is approximately 500 miles. The basin covers about 7,583 square miles in the following portions in each state:

State	Area (Sq. Mi.)[2]
Utah	3,381
Wyoming	1,507
Idaho	2,695
Total	**7,583**

This report primarily discusses the portion of the basin within Utah, consisting of a small part of Summit County, all of Rich and Cache counties, and the eastern quarter of Box Elder County. These areas are as follows:

County	Area (Sq. Mi.)[5]
Summit	293
Rich	1,078
Cache	1,175
Box Elder	835
Total	**3,381**

References are made throughout this report to the upper and lower basins within Utah. In general, "upper" means Summit and Rich counties, and "lower" means Cache and Box Elder counties. This is a simple and convenient distinction for the reader, but it is not the same definition used in the Bear River Compact (See Section 7).

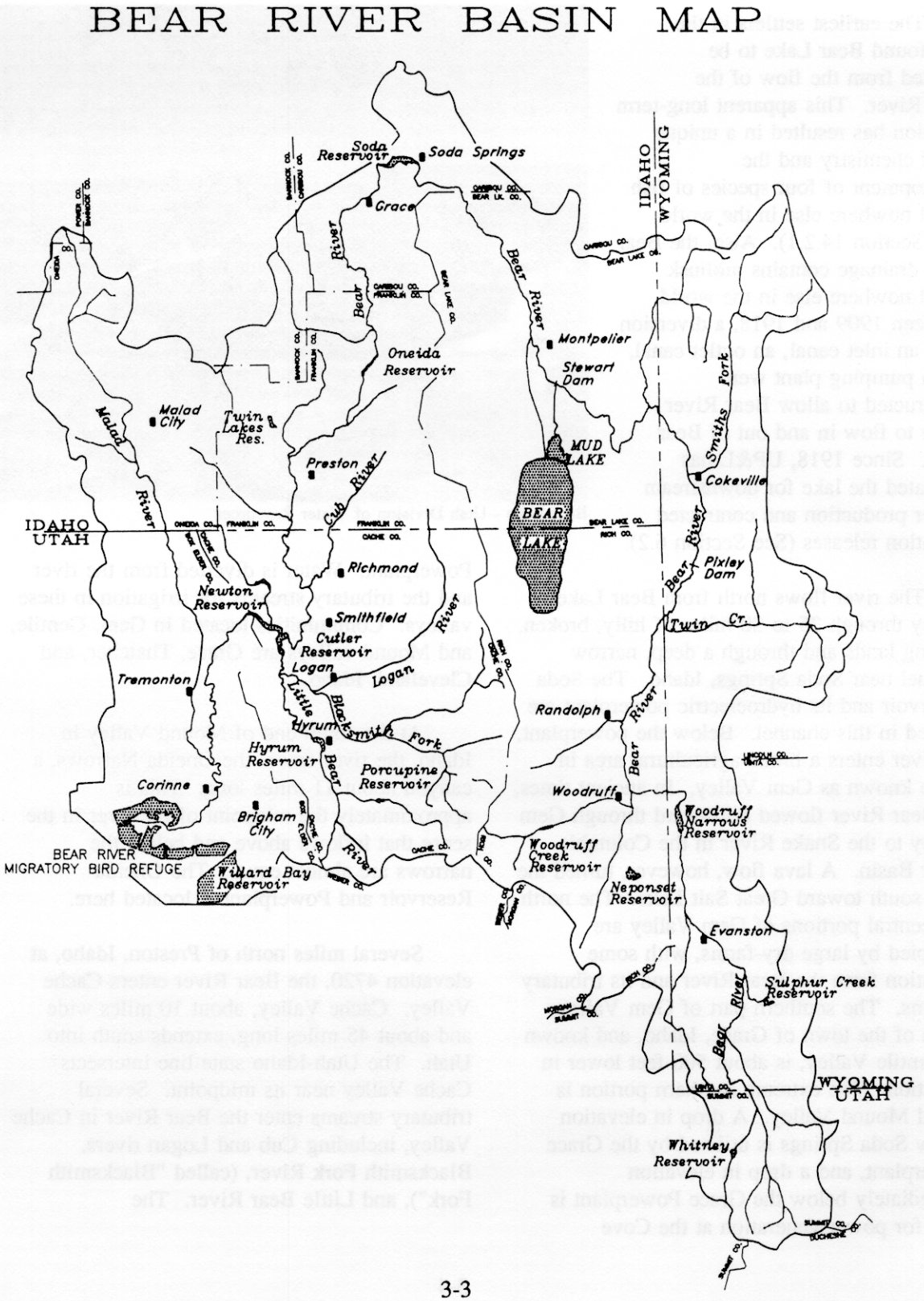
Although the Bear River Basin plan covers only the Utah portion, the following description encompasses the entire basin, as shown in Figure 3-1. It isn't possible to understand the hydrology of the river without considering the entire basin.

The headwaters are in the western end of the Uinta Mountain Range in Summit County, Utah, at elevations approaching 13,000 feet. In the upper reaches of the river, numerous small glacial lakes serve as catchment areas for the heavy snowfall and rain. About 25 miles downstream, near the Wyoming stateline, the river flow leaves the mountains and at elevation 7,000 feet enters a broad, gently-sloping valley about 10 miles wide.

This valley extends northward almost 100 miles, through Wyoming, Rich County, Utah, Wyoming again, and westward into Idaho at elevation 6,000 feet (approximately). Arable lands are common along this valley.

A few miles after the Bear River enters Idaho, it flows westward into the mid-portion of Bear Lake Valley. This valley is about 12 miles wide and 50 miles long, extending northward into Idaho and southward into Utah. The south end of the valley is inundated by Bear Lake, a feature of special importance to this report. The lake is 19 miles long, 7.5 miles wide, has 52 miles of shoreline, and covers a surface area of 110 square miles. The lake's

FIGURE 3-1


BEAR RIVER BASIN MAP
Soda Reservoir
Soda Springs
Grace
Bear River
IDAHO
WYOMING
Montpelier
Stewart Dam
Oneida Reservoir
Malad City
Malad River
Twin Lakes Res.
Preston
Cub River
MUD LAKE
Smiths Fork
Cokeville
IDAHO
UTAH
BEAR LAKE
Richmond
Newton Reservoir
Smithfield
Cutler Reservoir
Logan
Little Bear River
Blacksmith Fork
Tremonton
Hyrum Reservoir
Porcupine Reservoir
Pixley Dam
Twin Cr.
Randolph
Woodruff
Woodruff Narrows Reservoir
Woodruff Creek Reservoir
Neponset Reservoir
Corinne
Brigham City
BEAR RIVER MIGRATORY BIRD REFUGE
Willard Bay Reservoir
Evanston
Sulphur Creek Reservoir
WYOMING
UTAH
Whitney Reservoir

maximum depth is 208 feet, and it's total volume is 6.5 million acre-feet.

The earliest settlers in the area found Bear Lake to be isolated from the flow of the Bear River. This apparent long-term isolation has resulted in a unique water chemistry and the development of four species of fish found nowhere else in the world (See Section 14.2.1). Also, the Bear Lake drainage contains mollusk found nowhere else in the world. Between 1909 and 1918, a diversion dam, an inlet canal, an outlet canal, and a pumping plant were constructed to allow Bear River water to flow in and out of Bear Lake. Since 1918, UP&L has regulated the lake for downstream power production and contracted irrigation releases (See Section 6.2).

Bear Lake - Utah Division of Water Resources

The river flows north from Bear Lake Valley through 25 to 30 miles of hilly, broken, grazing lands and through a deep, narrow channel near Soda Springs, Idaho. The Soda Reservoir and its hydroelectric powerplant are located in this channel. Below the powerplant, the river enters a broad agricultural area in Idaho known as Gem Valley. In ancient times, the Bear River flowed northward through Gem Valley to the Snake River in the Columbia River Basin. A lava flow, however, turned the river south toward Great Salt Lake. The north and central portions of Gem Valley are occupied by large dry-farms, with some irrigation from the Bear River and its tributary streams. The southern part of Gem Valley, south of the town of Grace, Idaho, and known as Gentile Valley, is about 500 feet lower in elevation. The extreme southern portion is called Mound Valley. A drop in elevation below Soda Springs is utilized by the Grace Powerplant, and a drop in elevation immediately below the Grace Powerplant is used for power generation at the Cove Powerplant. Water is diverted from the river and the tributary streams for irrigation in these valleys. Communities located in Gem, Gentile, and Mound valleys are Grace, Thatcher, and Cleveland, Idaho.

At the south end of Mound Valley in Idaho, the river enters the Oneida Narrows, a canyon about 11 miles long. This is approximately the midpoint of the river in the sense that inflows above and below the narrows are almost equal. The Oneida Reservoir and Powerplant is located here.

Several miles north of Preston, Idaho, at elevation 4720, the Bear River enters Cache Valley. Cache Valley, about 10 miles wide and about 45 miles long, extends south into Utah. The Utah-Idaho state line intersects Cache Valley near its midpoint. Several tributary streams enter the Bear River in Cache Valley, including Cub and Logan rivers, Blacksmith Fork River, (called "Blacksmith Fork"), and Little Bear River. The

Bear River enters the Cache Valley from the northeast, runs rather sluggishly southward, and leaves the valley westward through a narrow two-mile gorge into Box Elder County. UP&L's Cutler Dam and its hydropower plant, the last hydropower plant on the Bear River, are located at the lower end of the gorge.

The Bear River then flows southwesterly through Box Elder County into Bear River Bay on the Great Salt Lake. The Bear River Bay is the largest contiguous natural freshwater bay in the United States. The Bear River Migratory Bird Refuge, a federally developed and operated waterfowl management area, is located in the north end of the bay.

The southwestern boundary of the Bear River Basin, as defined in this report and as shown on Figure 3-1, encloses the drainage area surrounding Bothwell, Thatcher, and Penrose (but not Blue Creek), the Public Shooting Grounds, the entire Bear River Migratory Bird Refuge, Willard Bay Reservoir, and the drainage area surrounding Willard and Perry.

3.2.2 Soils

The soils of the upper valleys in Rich and Summit counties have developed from alluvial sediments on flood plains, alluvial fans, and footslope areas at the base of the mountains. Quartzites and sandstones are the predominant parent material for the alluvium found in the upper valleys. Being so near the source of parent materials, the valley fill in the upper valleys consists mainly of coarse sands and gravels. In some places, however, the soils are made up of medium to fine textured topsoils overlying the more coarse-grained sand and gravels.

In Cache and Box Elder counties, valley soils have developed from sediments deposited in ancient Lake Bonneville. Much of the soil is medium to coarse-textured material, deposited at the edges of the valleys as fans. The lake terraces and finer materials, widely distributed on the broader interior floor of the valleys, were deposited during Bonneville and post-Bonneville times. As a result, a complex pattern of highly stratified soils exists.

In general, arable lands of the basin have good water transmission properties and adequate moisture-holding capacity which, with other favorable physical and chemical properties, make them well-suited for irrigated agriculture.

3.2.3 Climate

As elevations in the basin vary from 4,200 to 13,000 feet, precipitation also varies, from 9 inches to over 40 inches at higher elevations. So also does vegetation vary accordingly. Heavy alpine forests above about 8,000 feet give way to sagebrush, sparse grasses, and semi-desert conditions at low elevations. About one-fourth of the entire basin is forested, more than one-third is rangeland, and about one-fifth is cultivated. A detailed inventory of vegetative cover was made by the U.S. Department of Agriculture in 1978. For the Utah portion, the inventory is summarized in Table 3-1.

The Bear River Basin is typical of mountainous areas in the West, with wide ranges in temperature between summer and winter and day and night. The high mountain valleys experience long, cold winters and short, cool summers. The lower valleys are more moderate, with less variance between maximum and minimum temperatures. Precipitation in the lower basin during the May-September growing season is only 5 to 6 inches, compared to a crop water requirement of 20 to 30 inches. The average frost-free season (above 28° F.) varies from about 174 days at Corinne to 94 days at Woodruff.

In the higher valleys of Summit County south of Evanston, Wyoming, the growing season is much shorter.

TABLE 3-1
VEGETATIVE COVER ON UTAH PORTION OF BEAR RIVER BASIN

Type of Cover	Area (1000 ac.)	Percent of Total Area
Alpine, conifer, and aspen	585[a]	27.0
Mountain brush, juniper, sagebrush, greasewood	807[b]	37.3
Cropland	424[c]	19.6
Scattered native vegetation	118	5.5
Riparian, marshland, wet flats	101[d]	4.7
Open water	98	4.5
Residential, commercial, industrial	31	1.4
Total	12,164	100.0

Source: See Reference No. 2 (Tables V-1 and V-4).

[a]Includes 397,000 acres of aspen
[b]Includes 497,000 acres of sagebrush
[c]122,000 non-irrigated, plus 302,000 irrigated (Table 10-2).
[d]Includes Bear River Migratory Bird Refuge.

3.3 PLANNING PROCESS

To be flexible and accommodate changes in needs and circumstances, review and revision of the plan will be a continual process. This will provide opportunities for all state and federal agencies, as well as local government entities, organizations, and individuals, to present their concerns.

3.3.1 Steering Committee

The State Water Plan Steering Committee consists of the chairman and vice chairman of the Board of Water Resources, the executive director of the Department of Natural Resources, and the director and assistant director of the Division of Water Resources. The chairman of the Board of Water Resources is chairman of the Steering Committee. The Steering Committee guides plan development in regard to policy and resolution of issues, and approves the plan prior to official acceptance by the Board of Water Resources.

3.3.2 Coordinating Committee

To assure that all state agencies with specific water-related missions are involved, the following were invited by the director of the Division of Water Resources to participate on the State Water Plan Coordinating Committee:

Department of Natural Resources
  Division of Water Resources
  Division of Water Rights
  Division of Wildlife Resources
  Division of Parks and Recreation
Department of Environmental Quality
  Division of Drinking Water
  Division of Water Quality
Department of Agriculture
Office of Planning and Budget
Utah Water Research Laboratory

Each of these organizations designated a representative to participate. Some of the agencies participating on the coordinating committee have policy boards, commissions, or councils whose support is important to the basin plan. Each agency has the responsibility to keep its board informed about the basin plans.

3.3.3 Cooperating State Agencies

Nine other state agencies with expertise or involvement in water resources were asked to be cooperating state agencies. These agencies meet and work with the State Water Plan Coordinating Committee on an ad hoc basis.

3.3.4 Cooperating Federal Agencies

Many federal agencies have water resource programs affecting the State Water Plan. Eleven were asked to cooperate in developing the State Water Plan. Important input for the Bear River Basin Plan has been furnished from these agencies.

3.3.5 Basin Planning Advisory Group

Many water management agencies, special interest groups, private organizations, and political entities have a major interest in a basin plan. In order to involve local participation in the early stages of the planning process, a local basin planning advisory group was formed. Twenty-eight local individuals with an interest in state water planning were invited to review and comment on succeeding draft documents, and to help coordinate local basin input throughout the plan formulation and revision phases. The Basin Planning Advisory Group (BPAG) represents many of the local governments, water-user organizations, and other interested parties (See 3.4.3).

3.4 PUBLIC INVOLVEMENT

Public involvement is an important part of the planning process, and is necessary in assessing actual viewpoints and conditions in the basin. The opportunity for public discussion and input has been and will continue to be provided at the local, state, and federal levels as plan formulation moves through various phases.

Bear River Commission - Utah Div. of Water Resources

3.4.1 Public Involvement Program - 1985

In the summer and fall of 1985, an extensive public involvement program in the lower Bear River Basin was conducted for the Division of Water Resources by the Utah Association of Conservation Districts. Through a series of questionnaires, personal interviews, and 25 public meetings, the opinions of 250 residents of Cache and Box Elder counties concerning potential water development were obtained and listed. The concerns expressed at

that time by the public are summarized in Table 3-2. No attempt has been made to prioritize or rank the issues by order of importance. Further explanation and discussion are contained in the original public involvement report[4]

3.4.2 State Water Plan Public Review - 1989

Sixteen public meetings were held throughout Utah in March and April 1989 to obtain local input to the Public Review Draft of the State Water Plan. Two of these meetings were held in the Bear River Basin (Logan and Tremonton) in March 1989. Forty-six people attended these two meetings and participated in a discussion on the State Water Plan.

3.4.3 Advisory Review Draft - April 1990

During the first week of April 1990, an Advisory Review Draft of the Bear River Basin Plan was distributed to the advisory groups (BPAG and statewide), and to other local, state, and federal cooperating entities. The State Water Plan Steering Committee met with the local BPAG on April 4, 1990, for a brief orientation and an introduction to the Advisory Review Draft and the basin planning process. Division staff held nine meetings in May and June with 24 members of the BPAG to discuss the Advisory Review Draft and gather comments.

3.4.4 Advisory Review Draft, Revision #1 - May 1991

Comments received from the coordinating committee and local, state, and federal cooperating entities on the Bear River Basin Advisory Review Draft were reviewed and (as appropriate) incorporated into a revised Advisory Review Draft. The revised draft was distributed to the advisory review entities in May 1991. Division staff held five meetings in July with members of the BPAG to discuss the draft and obtain comments.

3.4.5 Public Review Draft - November 1991

Comments received on the revised Advisory Review Draft were incorporated into a Public Review Draft and distributed to the general public in November 1991. Seven public meetings were held in December 1991 to discuss and receive comment on the Public Review Draft. Thirty-four written comments were submitted for consideration in addition to 31 oral comments at the meetings. Appropriate comments have been incorporated.

3.5 REFERENCES

In addition to the references listed below, the Utah State Water Plan, January 1990, discusses statewide aspects of state water planning.

1. "Hydrologic Inventory of the Bear River Study Unit," Utah State University for Utah Division of Water Resources, February 1973.

2. "Summary Report, Water and Related Land Resources, Bear River Basin," Cooperative Study, U.S. Department of Agriculture in cooperation with the States of Utah, Idaho, and Wyoming, 1978.

3. "Water-Related Land Use Inventories, Bear River Basin," Utah Division of Water Resources, January 1991.

4. "Public Involvement Program Concerning Water Development in the Lower Bear River Basin," Utah Association of Conservation Districts, for Utah Division of Water Resources, January 1986.

5. "Land Resource Data," U.S. Department of Agriculture, 1976. (Part of Reference No. 2).

TABLE 3-2
MAJOR ISSUES AND/OR CONCERNS EXPRESSED BY RESIDENTS - 1985

* Local water needs should be satisfied before any water is exported from the basin.

* The Public Involvement Program (begun in 1985) will be futile unless public involvement is continued throughout the planning process.

* The unit cost to develop agricultural water from the Bear River may be higher than other sources.

* The fact that the Oneida Reservoir site is located in Idaho may present political problems.

* The construction of some of the reservoir sites will inundate existing facilities. These lost facilities need to be replaced.

* Hydropower benefits should be used to pay for the project, rather than going into the pocket of a private developer.

* All those who benefit from the project should be expected to pay a fair share of the cost.

* Would the project be owned and operated locally, by the state, or by a private party?

* Would Salt Lake County's municipal and industrial uses become the controlling element in the operation of the Bear River project?

* In dry years would the available water be re-allocated to reflect the needs of municipal and industrial uses ahead of local prior rights for agriculture?

* What are the environmental impacts?

* Will the repayment and cost-sharing arrangements be equitable for both local water users and users of exported water?

* What assurance do local residents have that dams and other structures will be adequately designed to preclude failure?

* How would construction be funded?

* What role will groundwater play in the development of Bear River water?